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Habits and behaviors of e-health users: a study on the influence of the Interface in the perception of trust and credibility

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Abstract

Online health information and its exploitation in different digital contexts is increasing, creating new interaction experiences in which the perception of credibility and trust plays a fundamental role. In this processes, the Interface has a crucial function, mediating the interaction between users and information and, consequently, influencing health decision-making processes and supporting health promotion programs. However, more knowledge is needed to deeply understand this influence in order to comprehend how it works and how can it be improved. The study presented in this paper aims to contribute to this field, researching on the influence that the Interface can have in the perception of trust and credibility of e-health websites. Starting from a five-dimension interface framework that we have developed, and that goes behind the common visual perspective, we have collected data with an online survey and eye tracking sessions. These five dimensions (visual, information architecture, interaction, social presence and user experience) allowed us to reach a deeper understanding of our results, namely regarding the importance that the visual design, information architecture and user experience have on online health information habits and behaviors, particularly in what concerns searching, seeking, communicating and sharing health information.

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1. Introduction

The increased demand for health information on the Internet reinforces the need to develop research on the quality of the available e-health information and on the strategies and procedures that consumers use to assess it. This problem has already been addressed by different studies, which results reveal the direct influence of the interface in the perception of credibility and trust[1–4]. The importance of deepening knowledge about credibility and trust of e-health information, focusing on the relationship between the user and the interface, is mentioned in several studies that address the issue of online trust[5–9]. Some of the most important studies in this matter have been conducted by Fogg[10–14], his work is of major importance under the context of the research presented in this paper, as he focuses on the e-health field, while most of the other studies on online credibility and trust have been developed on the e-commerce area. From our perspective, understanding how users evaluate the credibility of a website is of utmost importance when conduction e-health studies, enabling a better comprehension of education and health promotion[15] as well as decision-making processes and adherence to treatment[16–19].

Trust is based on interactions and is a process where there are always two parties involved; credibility is a perceived quality, not residing in an object, a person or a piece of information. Online trust and credibility are, therefore, directly related to the structure of the communication medium that, in the case of digital media, materializes itself on the Interface through different dimensions. The technological mediation between products and services directly influences the perception of the individual trust. The influence of the Interface on the perception of trust and credibility of online resources, particularly with regard to health information websites, is a critical area, namely concerning decision-making processes, and its study can produce results that can be extend to other areas[28, 29].

Our approach to the investigation presented in this paper considers other dimensions[20] beyond the visual or graphical (addressed most of the times in interface studies). We believe that Interface cannot be reduced only to visual aspects, as it mediates the experience through which we interact (with others, objects and spaces) acting like an important communication intermediary and thus influencing the relationship between digital systems and people. In order to make a more detailed analysis of the Interface and its influence in these processes, and based on the literature review[6,15,17,21–24], we have developed an Interface analysis framework with five interface dimensions: visual, information architecture, interaction, social presence and user experience[20,25,26,27]. Although this framework was developed in the context of this study that focus on health information websites, we believe that it could be applied to study websites interfaces from all fields. Also it is not limited to the study of trust and credibility as it helps to look at the Interface as a structure with different layers and purposes in the user interface relationship. The results we already obtained on the influence of the Interface dimensions in trust and credibility showed that the most influent dimensions are the information architecture and user experience (88.9%) followed by the interaction dimension (84.30%), the visual dimension (66.2%) and finally the social presence dimension (57.6%)[27].

In this paper we present part of our study on the interface influence on the perception of trust and credibility of e-health websites, focusing on the results already obtained considering the search, communication and share habits and behaviors of e-health users.

2. Methods

In order to understand the interface contributions to the perception of credibility and trust by users in the field of e-Health, the methodology adopted for this study is mainly influenced by an user centered design approach[20].

In this specific paper we decided to present and discuss some of the results that we already obtained concerning the user analysis — user's characterization regarding the use, communication and share of health information and perception of its credibility and trust. We also obtained data that characterizes the perception of credibility and trust of the different interface dimensions under analysis[30]. These results were obtained using the following instruments, above described: online survey and eye tracking sessions.

2.1. Online survey

With the online survey we were able to perform a generic characterization of the respondents regarding: Internet use; communication and share of health information; and perception of credibility in e-health websites considering the influence of the interface.

The survey was based on a analysis structure[20] that had three main concepts: interface; credibility/trust; and e-health users. The survey was divided into two different parts. The first part articulates the dimensions of "access and participation", considering different indicators (such as gender, age, motivation, and health conditions, frequency of use, sharing and health information communication) with the ones related to "credibility and trust" (considering familiarity, reputation and nature of the information). The selected websites to perform this analysis in the survey were: "Biblioteca Virtual de Saúde (BVS)[†]", "Medicine NET (MN)[‡]", "Manual Merk (MM)[§]", "Portal do Utente (PU)[**]". This selection resulted from an analysis of several websites in the field of health; we focused primarily on websites in Portuguese language, since the survey was to be applied in Portugal.

The second part of the survey explores the "superficial credibility"[14] through the visual dimension, considering color, grid and typography. It also explores the "acquired credibility,"[14] analyzing the dimensions of information architecture (related to the visual organization of information), social presence (related to the presence of social cues), interaction (related with the ease of navigation and the achievement of the user goals) and user experience (related to the user experience by integrating all of the above components and questioning the user's satisfaction with the website).

The survey was developed and tested in the first months of 2014 and made available online between March and May 2014. The dissemination of the survey was made through distribution lists at Porto University and at the University of Aveiro, having also been disclosed at "Comunidade Rede Mãe[††]". From a total of 672 online records, we had 154 completed responses to the questionnaire.

2.2. Eye tracking sessions

Aiming to complement and better understand data collected with the online survey eye tracking sessions were promoted, with the main objective of deepen knowledge on how users look at the pages of a e-health website. With these sessions we were trying to identify the interface elements that influence the credibility of perception and trust, in order to correlate, or even validate, the design principles present in the literature review.

The sessions were announced by email reporting the conditions to participate in the study and interested parties responded showing interest. All interested parties were asked to answer a short questionnaire composed on demographics, e-health habits (search, communication and share of online health information) and visual abilities (since eye tracking tests depend on the functioning of the eyes).

The inclusion criteria's for participant's selection (six, in total) were: visual abilities, being over 18 years old and have, at least, one of the following health conditions: pregnancy, oncology disease or a chronic disease (asthma, diabetes, chronic obstructive pulmonary disease - COPD, or other).

The tests were constructed to assess e-health websites in two different phases. The first phase was exploratory: participants were invited to look at five different websites — four of those websites with generic health information, and one directly related to their health condition — to make a judgment of credibility. In the second phase of the test, participants were invited to choose a favorite website related to their condition to accomplish some tasks as "Found the possible treatments to your health condition" .The sessions had an average duration of 45 minutes per participant and took place between the months of December 2014 and April 2015.

[†] Biblioteca Virtual em Saúde: http://www.bireme.br/php/index.php
[‡] Medicine NET: http://www.medicinanet.com.br
[§] Manual Merk: http://www.medicinanet.com.br
[**] Portal do Utente: https://servicos.min-saude.pt/utente/
[††] Rede Mãe: http://redemae.sapo.pt

3. Results

The results presented in this paper aim to characterize the habits and behaviors of e-health users, considering some of the data collected during the research that frames this study. Both the survey and the eye tracking sessions produced a large amount of data, which calls for a careful selection of the results to discuss in this paper. In the survey we had a total of 672 records and, after data treatment, we reached 219 completed responses; from these 219, we ended up with 154 valid responses, as the inclusion criteria was the frequency of using the Internet to search health information: all the respondents that said "never" to this question (65) were not considered.

For the eye tracking sessions, we had a total of 6 participants: 2 with oncologic disease, 2 with asthma and 2 with COPD.

3.1. Online survey results and discussion

In what concerns the generic characterization of our participants 77.3% have between 18 and 34 years, 63% are students and 74.7% are female. These results are largely due to the fact that the survey has been announced via email in the universities of Porto and Aveiro. We are aware that in this age health problems are not very frequent, which can be pointed out as a barrier to our study inclusion criteria (habits of searching online for health information), as the need for health decision-making and even the motivation for search online health information can be reduced at these ages, although a study published back in 2005 about health information-seeking behavior in adolescence shows that "adolescents are interested in finding information about a range of health topics"[31(p1468)]. Also, the result obtained regarding the gender of the respondents (mostly women) tend to neutralize this potential deviating effect since the number of female responders is three times the number of male respondents. Typically, women search more online for health information[32].

Regarding participants' habits of seeking, communicating and sharing online health information, data collected with the survey enabled the systematization of important results, as described below and illustrated in Fig. 1.

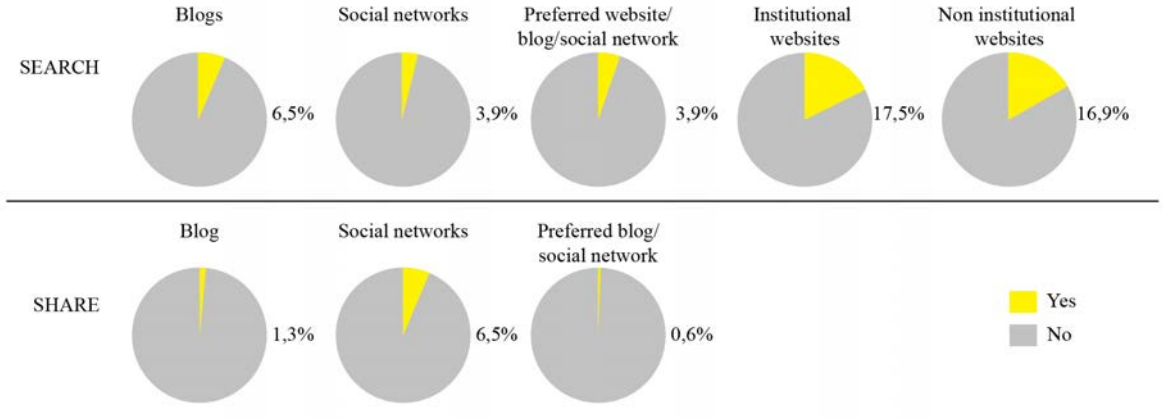

Fig. 1. Respondents' search and share habits

The main findings in what concerns habits of seeking for online health information show that there is not a substantial difference in the use of institutional websites (17.5%) and non-institutional websites (16.9%) for health information seeking. Social networks and blogs are not frequently used to seek health information. The frequency of seeking health information in blogs is 6.5% and in social networks is 3.9%. These results are close to the ones reported in a 2013 Pew survey where only 1% of online health seekers started their research at a social network site as Facebook[32].

Regarding health information sharing habits, our results demonstrate that sharing health information is not a common practice among e-health users. Only 6.5% of respondents reported that they share health information in social networks and 1.3% in blogs. These results are aligned with Gray et al. [31] conclusions about health information

online use in adolescents: “Young people sought out communication with peers on the internet, but not usually for health information” (p1475), and with the Pew survey[32] where only 8% of internet users, in the past 12 months, posted a health-related question online or shared their own personal health experience online in any way. It also seems that there is not a direct relation between the habit of sharing information in social networks (6.5%) and blogs (1.3%) with the use of a preferred/familiar social network or blog (0.6%). Finally, there is a noticeable difference between the results related to the habits of ‘sharing health information found online in social networks’ and the ones related to the ‘use of social networks for seeking and sharing personal health information’: we found low percentages of respondents indicating that they seek (3.9%) and share (6.5%) this type of information in social networks; whereas in the case of the use of social networks to seek and share personal health information, 27.3% reported to do it in social networks dedicated to health issues and 49.3% in and non-dedicated social networks.

With regard to health information communication habits, we found that 63.6% of the respondents never record health data in personal areas, while 20.1% rarely does it, compared with 5.8% that often makes it or 9.7% that records these data occasionally. As for participation in online programs to improve the quality of life 68.2% of the respondents never do it, compared to 1.3% who do it very often. These results must be analyzed considering our respondents demographic profile, as they belong to a group age in which health problems are not frequent and, consequently, may not be motivated to monitor health data or to enroll in quality of life improvement programs; this is also an age where diets and exercise programs are frequent; our results regarding this habits (36.2%) are higher when compared with the 20% of U.S adults that “have tracked their weight, diet, exercise routine or some other health indicators or symptoms online”[33].

Faced with the question: "Do you use a social network to ask or share health information?" 93.5% of respondents indicated “no”. However, when to the same number of respondents was asked to position themselves in relation to the frequency in which they write about a particular health condition on social networks, only 79.2% indicated they never did it. The remaining 20.7% do it rarely (14.9%), occasionally (3.2%), often (1.3%) and very often (1.3%). Also, on the question: "Do you use a blog to ask or share health information?" 98.7% of respondents indicated “no”. But, when was asked to position themselves in relation to the frequency with which they write about a particular health condition on blogs, only 89.0% indicated that never was; the remaining 11% do it rarely (9.1 %), occasionally (1.3%) and very often (0.6%). As can be seen in the results presented and also reported on the U.S survey[33], sharing and communicating health information are not the most common activities among health information users. These results are also aligned with the findings of Choudhury [et. al.] that indicates that users perform different health activities in different platforms, and that “search engines are more extensively used for health activities than social media”[29].

3.2. Eye tracking sessions results and discussion

Besides the search, communication and sharing habits described above, there are also search behaviors that are important to analyze under the context of a study on the influence of the interface in the perception of trust and credibility. Conduction eye tracking sessions with e-health users became a required step in this research, as the interface is primarily explored with the users’ eyes. According to Nielsen[34] users see the contents of a Web page or another artifact according to the task proposed to them. In the case of the eye tracking sessions developed in our study, the task proposed to the participants was to evaluate the credibility of a website (BVS – Biblioteca Virtual de Saúde / Virtual Health Library[‡‡]) in order select one of its topic to search for information about their health condition or even recommend it to a friend or family. Despite this oriented task of evaluating the credibility of the website, we can consider this an exploratory more than an goal-directed search behavior[35].

Table 1. Participants characterization and BVS website frequency of use credibility evaluation

Participant	Gender	Age	BVS frequency of use	Credibility evaluation	Time of task	Time of first interaction

[‡‡] Biblioteca Virtual em Saúde: http://www.bireme.br/php/index.php

P03	Female	34	Never	Very credible	03:32m	42,94s
P04	Male	20	Never	Very credible	01:28m	44,29s
P05	Male	51	Never	Credible	03:32m	30,88s
P06	Male	40	Never	Credible	04:12m	76,56s
P07	Male	19	Never	Completely credible	02:45m	16,01s
P08	Female	18	Never	Very credible	04:53m	37,25s

Table 1 shows the participants gender and age. Contrary to the results obtained with the survey we had more male participants we also had different ages but, differing from the findings of Buscher et. al[36] we didn't find a major difference in terms of gender or even age range, in the time of the first interaction/page (or according to Faraday[37], in the webpage reading process/ search phase).

The images presented above aggregate all users eye movements and fixations in the homepage of the BVS website. Fig. 2 shows that BVS homepage is mainly composed by links, not only in the left portion of the page but also in the center and right portion, being these an important target to our participants' eye fixations.

Fig. 2. (a) P03 BVS Homepage gaze plot; (b) P04 BVS Homepage gaze plot; (c) P05 BVS Homepage gaze plot; (d) P06 BVS Homepage gaze plot; (e) P07 BVS Homepage gaze plot; (f) P08 BVS Homepage gaze plot; (g) Aggregates all participants BVS Homepage gaze plot; (h) Aggregates all participants BVS Homepage heat map; (i) BVS Homepage.

Our images patterns reveal more than the usual F-shaped pattern of viewing web pages[38]; it seams like our participants have looked for information in the right portion of the page, besides the usual left one. Even participant P08, which reveals a F-shaped pattern in Fig. 2, didn't spent much time in this homepage, presenting eye fixations also on the right portion of the page. The image presented in Fig. 2 clearly demonstrates a pattern more like an H than an F shape, contrary to what is frequently reported[35, 36,38].

Images a) and d) of Fig. 2 reveal that the participants looked several times for the same information and links. According to Nielsen "this usually occurs when a page or a site is disorganized and often has to much on it"[34(para376)]. Indeed, some of our participants' gaze plot images (b and d) reveal some scouring[34(para376)] behavior.

In terms of users reading analysis, our heat map could be considered a typical web reading heat map where participants have read mainly the first sentences of the page, headings and subheadings [35] following a combination of vertical and horizontal scanning patterns in most of the cases. As mentioned before, some gaze plots reveal diagonal scanning behavior that could be related with the page layout organization.

These results point out that e-health users present search behaviors, in terms of their eye gaze, that underline the importance of observing the high impact that interface, in its different dimensions, can have on the perception of credibility of a website, namely in what concerns visual design and information architecture.

4. Conclusions

This study was conducted to determine the Interface contributes for the perception of trust and credibility on users of e-health information. For that we created a framework that divides the interface in five dimensions: visual, information architecture, interaction, social presence and user experience[20]. Our findings support the view that all the interface dimensions have a direct relation with trust and credibility perception[27], although this paper only presents a part of our results, focusing on users' habits for search, communicate and share online health information. We also analyzed eye movements and fixations behavior in eye tracking sessions and asked our participants to assess health information websites in terms of credibility.

The social nature of health information seems to have a long way to go, as the percentage of respondents who use social platforms to seek health information in blogs (6.5%) and in social networks is (3.9%) is not significant, being this results apparently directly related with the type of platform used[29]. In what concerns posting/writing about health information, 20.7% do it in social networks and 11% in blogs. However, sharing health information that was found online is more frequent among the respondents: 27.3% do it in social networks dedicated to health issues and 49.3% in social networks not dedicated to health issues. These results on social activities related with health information and the ones we obtained in the interface dimensions influence on credibility, where the social presence dimension was the one with less influence (57,4%)[27], reveal that some work remains to be done in understanding the role of this social dimension when designing e-health Interfaces, namely in what concerns its role to promote participation and credibility.

The eye tracking sessions revealed interesting results. Contrary to the findings of Buscher et. al[36] we didn't find a major difference in terms of gender or even age range, in the time of the first interaction/page. In the survey, three main Interface dimensions stood out as the ones with the more determinant role in influencing credibility: information architecture (88.9%) user experience (88.9%) and visual dimension (66.2%). Our heat maps and gaze plots reveal more than the usual F-shaped pattern of viewing web pages[38]; it seams like our participants have looked for information in the right portion of the page, besides the usual left one. This and some uncovered scouring behavior could be related with page layout disorganization related to the visual and information architecture dimensions. The BVS website had a positive credibility evaluation, but based on our analyses we believe that visual dimension of BVS could have a better influence in the website credibility, and information architecture specially in what concerns to the elements organization in page[27].

Our results also indicate that there is not a substantial difference, in terms of credibility perception, in the use of institutional or non institutional health information websites, although other studies have suggested that there is a direct relationship between trust and organizations[8,39] Our future work involves the analysis of the institutional presence influence in credibility.

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